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TECHNICAL SPECIFICATIONS FOR THE SOUND PRESSURE METER

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1.

Two complete underwater sound pressure meters are to be designed and built. They are to operate in the frequency ranges between 5 to 1000 cps, and 30 to 12,000 cps.

The following specifications apply to both types of sets:

a) P_{min} = 0.5 μb = U_{min} (μb = microbar)

b) P_{max} = 50,000 μb = U_{max}

c) The frequency response curve must not exceed ± 2 db

d) The sound pressure indication must not vary more than 2 db within a temperature range of 0 to 30°C.

e) Supply voltage fluctuations of ±10% must not change the indication by more than 2 db

f) The set should be operated from an AC line of 120 or 220 V.

g) The measuring hydrophones must be able to withstand a pressure of 25 atm. above normal.

h) The walls of the housings of the measuring hydrophones are to be coated with sound-absorbent material

i) The dimensions of the pressure indicator itself must not be greater than one-quarter of the wavelength.

j) An electrically shielded cable, 250 m long, and water-tight up to pressures of 25 atm. above normal, is to connect the measuring hydrophone and measuring amplifier.

k) Both ends of the cable are to be fitted with pluge or jacks for facilitating connections.

l) Unreeling and reeling up of the hydrophone cable is to be carried out by means of a special cable drum, the drum to be capable of being operated both manually and by an electric motor.

m) The cable drum must be so designed as to permit the dropping and hauling in of a measuring hydrophone from aboard ship.

n) The length of cable unreeled should be known at all times.

o) The measuring amplifier should have a max. frequency response variation of ± 1 db. Its noise voltage is to be less than 10 μV. The measuring instrument must

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indicate p_{eff}.

p) The following measuring ranges are to be provided for:

1.) 0 - 3 μb , 2.) 0 - 10 μb, 3.) 0 - 30 μb, 4.) 0 - 100 μb, 5.) 0-300 μb,
6.) 0 - 300(?) μb, 7.) 0 - 1000 μb, 8.) 0 - 3,000 μb, 9.) 0 - 10,000 μb,
10.) 0 - 30,000 μb, 11.) 0 - 100,000 μb.

q) Separate measuring jacks are to be provided for connecting of the accessory equipment, such as Neumann recorder, oscillograph, spectrometer, and earphones. For this purpose, the set is to contain a special power stage whose output load must not influence the indication. The output is matched to the individual accessory units and closed.

r) The output control is to be ~~controllable~~ adjustable within a range from 0 to 60 db.

s) A range switch is to be provided in the measuring amplifier to select the different ranges. The switch is to operate a relay which ~~draws~~ obtains its voltage from a special battery.

t) The noise voltage must be no more than half of the effective voltage at the limit of sensitivity. $U_R = \frac{1}{2}U_{min}$

u) The calibration accuracy of the indicated value may show a maximum error of ± 20% [sic !] for the entire apparatus (microphone, cable, measuring amplifier).

v) An insulation of at least 100 megohm is required between hydrophone crystal and housing.

w) The measuring amplifier must operate normally over a 24-hour period at a temperature of 30°C and air humidity of 95 ± 3%.

x) The mechanical pressure testing of the hydrophones and cables is to be carried out at 25 atm. above normal over a 48-hour period.

y) The housing of the measuring amplifier must be tight against spray.

z) The cable insulation must be 100 megohms

zz) ~~The~~ calibrating ovn of the pressure scale should be possible in every range.

zzz) The frequency variation of the measuring amplifier must be accurately measurable even at the initial frequencies (± 5 or 30 cps).

21. 1 testing set for crystal facing - 259

22. 1 hydrophone testing set - 244

23. 1 tropical weather chamber - 245

24. 1 auxiliary basin - 256

Technical specifications for the development of a combined HF cable:

1. The cable is to be used for a measuring apparatus and is designed for permanent emplacement in seawater at depths down to 250 m.

2. It should be shielded against external electrical and magnetic fields. It is to be flexible and be able to withstand repeated reeling and unreeling.

3. The cable is to contain a HF channel up to 15,000 cps, with eight to twelve strands of 0.75 sq. mm copper cross-section, for the supply current from the storage batteries and a voltage of 300 V.

4. The insulation resistance between the individual strands of the HF channel is to be no less than 200 megohm (1 megohm per 100 V). The insulation between the supply current strands is to be no less than 20 megohms.

5. When not in operation, the cable is to be wound on a special drum, which must be suitable for being placed on the deck of a ship. The outer end of the cable is to be provided with an attachment (jack or plug) for connecting it to the measuring apparatus

6. The tensile strength of the cable is to have a safety factor of 8, even under an additional 35 kg load at the end of the cable.

7. The cable must be designed in such a way that the lead into the microphone housing is pressure- and waterproof.

8. The capacitance of the high-frequency channel of the cable is to be no more than 50 mmfd per meter.

9. The cable is to be protected from mechanical damage.

10. The cable is to be tested according to the following points:

a) hydraulic pressure test at 25 atm above normal over 48 hours

b) Checking the capacitance for every meter of length

c) Measuring its length

11. Design drawings for the cable drum which is used when the cable is in operation

12. Design drawings for special plugs and jacks for connecting the strands of the cable (to be attached to the drum)

13. Design drawings for the drum rack with drive which is attached at the operating site. (Drawings without electric drive motor and switching equipment).

Each sound pressure measuring device consists of:

Version I Frequency range 5 - 1000 cps	Version II Frequency range 30 - 12000 cps
1. 1 measuring hydrophone -234	1. 1 measuring hydrophone - 235
2. 1 battery case -234	2. 1 battery case - 235
3. 1 measuring cable -243	3. 1 measuring cable - 243
4. 1 measuring amplifier -238	4. 1 measuring amplifier - 238
5. 1 decremeter -230	5. 1 decremeter - 230
6. 1 set of earphones -239	6. 1 set of earphones - 239
7. 1 spectrometer - 231	7. 1 spectrometer - 236
8. 1 photo attachment with synchronizer switch - 265	8. 1 photo attachment with synchronizer switch - 265
9. 1 three-loop oscillograph -237 with control device	9. 1 three-loop oscillograph - 238 with control device
10. 1 generator -239 1 gasoline eng. for generator 240/41	10. 1 generator - 239 1 gasoline eng. for generator
11. 1 blocking circuit - 242	11. 1 blocking circuit - 242
12. 1 plug for measuring cable - 242	12. 1 plug for measuring cable - 242
13. 1 cable drum - 266	13. 1 cable drum - 266
14. 1 rack for measuring amplifier - 262	14. 1 rack for measuring ampl. - 262

Laboratory 11 has planned and ordered the following measuring and accessory equipment for testing and calibrating the sound pressure meters:

1. 1 measuring area for the measuring basin - 246
2. 1 measuring basin, 2 x 8 x1.5 m - 246
3/4. 1 shield each for measuring basin - 246
   a) Profiled wall
   b) Plane wall
5. 1 hydrophone carriage - 246
6. 1 transmitter carriage - 246
7. 1 cover plate for low-frequency sound radiator - 246
8. 2 oscillator plates - 246
9. 1 control panel for oscillator - 246
10. 1 Leonard drive - 246
11. 2 audio frequency lines - 246
12. 1 low-frequency sound radiator - 247
13. 1 medium frequency sound radiator, 70 W - 243
14. same, 1.5 kW - 255
15. 1 power amplifier - 229
16. 1 high frequency sound amplifier, 1.5 kW - 249
17. 1 calibration scale -254
18. 2 auxiliary hydrophones - 258
19. 1 laboratory measuring amplifier 255
20. 1 radiometer set - 257